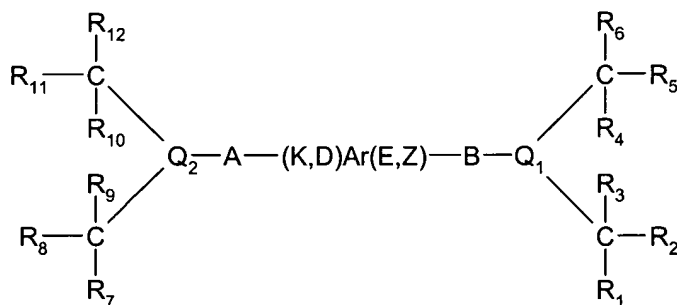


AMENDMENTS TO THE CLAIMS

1. (Currently amended) A process for the carbonylation of C₃-C₂₀ ethylenically unsaturated compounds which process comprises reacting said C₃-C₂₀ ethylenically unsaturated compound with carbon monoxide in the presence of a source of hydroxyl groups and of a catalyst system, the catalyst system obtainable by combining:

- (a) a metal of Group VIII or a compound thereof; and
- (b) a bidentate phosphine, stibine or arsine of general formula (I)



wherein:

Ar is a bridging group comprising an optionally substituted aryl moiety to which the phosphorus atoms are linked on available adjacent carbon atoms;

A and B each independently represent lower alkylene;

K, D, E and Z are substituents of the aryl moiety (Ar) and each independently represent hydrogen, lower alkyl, aryl, Het, halo, cyano, nitro, OR¹⁹, OC(O)R²⁰, C(O)R²¹, C(O)OR²²,

$\text{NR}^{23}\text{R}^{24}$, $\text{C(O)NR}^{25}\text{R}^{26}$, $\text{C(S)R}^{25}\text{R}^{26}$, SR^{27} , C(O)SR^{27} , or $-\text{J-Q}^3(\text{CR}^{13}(\text{R}^{14})(\text{R}^{15}))\text{CR}^{16}(\text{R}^{17})(\text{R}^{18})$

where J represents lower alkylene; or two adjacent groups selected from K, Z, D and E together with the carbon atoms of the aryl ring to which they are attached form a further phenyl ring, which is optionally substituted by one or more substituents selected from hydrogen, lower alkyl, halo, cyano, nitro, OR^{19} , OC(O)R^{20} , C(O)R^{21} , C(O)OR^{22} , $\text{NR}^{23}\text{R}^{24}$, $\text{C(O)NR}^{25}\text{R}^{26}$, $\text{C(S)R}^{25}\text{R}^{26}$, SR^{27} or C(O)SR^{27} ;

R^1 to R^{18} each independently represent lower alkyl, aryl, or Het;

R^{19} to R^{27} each independently represent hydrogen, lower alkyl, aryl or Het;

each of Q^1 , Q^2 and Q^3 (when present) each is independently represent selected from the group consisting of phosphorous, arsenic or antimony and in the latter two cases references to phosphine or phosphorous above are amended accordingly;

wherein the carbonylation reaction is carried out at a temperature of between -30°C to 49°C and under a CO partial pressure of less than $30 \times 10^5 \text{ N.m}^{-2}$.

2. (Original) A process according to claim 1, wherein R^1 to R^{18} each independently represent C_1 to C_6 alkyl, C_1 - C_6 alkyl phenyl (wherein the phenyl group is optionally substituted as defined herein) or phenyl (wherein the phenyl group is optionally substituted as defined herein).

3. (Currently amended) A process according to claim 1, wherein R^1 to R^{18} each independently represent non-substituted C_1 to C_6 alkyl ~~such as methyl, ethyl, n-propyl, isopropyl, n-butyl, iso-butyl, tert-butyl, pentyl, hexyl and cyclohexyl.~~

4. (Currently amended) A process according to claim 1, wherein each of the groups R^1 to R^3 , R^4 to R^6 , R^7 to R^9 , R^{10} to R^{12} , R^{13} to R^{15} or R^{16} to R^{18} together independently may form cyclic structures ~~such as adamantyl, 1-norbornyl or 1-norbornadienyl.~~

5. (Previously presented) A process according to claim 1, wherein each R^1 to R^{18} group represents the same lower alkyl, aryl, or Het moiety as defined herein.

6. (Previously presented) A process according to claim 1, wherein, each R^1 to R^{18} represents methyl.

7. (Previously presented) A process according to claim 1, wherein each Q^1 , Q^2 and Q^3 (when present) represents phosphorous.

8. (Previously presented) A process according to claim 1, wherein in the compound of formula I, A, B and J (when present) each independently represent C_1 to C_6 alkylene which is optionally substituted as defined herein.

9. (Previously presented) A process according to claim 1, wherein the lower alkylene which A, B and J may independently represent is $-CH_2-$ or $-C_2H_4-$.

10. (Previously presented) A process according to claim 1, wherein K, D, E or Z independently represents hydrogen.

11. (Previously presented) A process according to claim 1, wherein two of K, D, E and Z together with the carbon atoms of the aryl ring to which they are attached form a phenyl ring, the phenyl ring being optionally substituted with one or more substituents selected from aryl, lower alkyl (which alkyl group may itself be optionally substituted or terminated as defined below), Het, halo, cyano, nitro, OR^{19} , $OC(O)R^{20}$, $C(O)R^{21}$, $C(O)OR^{22}$, $NR^{23}R^{24}$, $C(O)NR^{25}R^{26}$, SR^{27} , $C(O)SR^{27}$ or $C(S)NR^{25}R^{26}$ wherein R^{19} to R^{27} each independently represent hydrogen or lower alkyl (which alkyl group may itself be optionally substituted or terminated as defined herein).

12. (Previously presented) A process according to claim 1, wherein the hydroxyl group containing compound includes water or an organic molecule having a hydroxyl functional group.

13. (Original) A process according to claim 12, wherein, the organic molecule having a hydroxyl functional group may be branched or linear, and comprises an alkanol, particularly a C_1 - C_{30} alkanol, including aryl alkanols, which may be optionally substituted with one or more substituents selected from lower alkyl, aryl, Het, halo, cyano, nitro, OR^{19} , $OC(O)R^{20}$, $C(O)R^{21}$, $C(O)OR^{22}$, $NR^{23}R^{24}$, $C(O)NR^{25}R^{26}$, $C(S)R^{25}R^{26}$, SR^{27} or $C(O)SR^{27}$ as defined herein. Highly preferred alkanols are C_1 - C_8 alkanols such as methanol, ethanol, propanol, iso-propanol, iso-butanol, t-butyl alcohol, n-butanol, phenol and chlorocapryl alcohol.

14. (Previously presented) A process according to claim 1, wherein the carbonylation of an ethylenically unsaturated compound as defined herein may be performed in one or more aprotic solvents.

15. (Previously presented) A process according to claim 1, wherein the reaction is carried out in the absence of any external aprotic solvent ie. an aprotic solvent not generated by the reaction itself.

16. (Previously presented) A process according to claim 1, wherein the process is carried out with the catalyst comprising a support.

17. (Previously presented) A process according to claim 15, wherein the support material is porous silica which has a surface area in the range of from 10 to 700 m²/g, a total pore volume in the range of from 0.1 to 4.0 cc/g and an average particle size in the range of from 10 to 500 μm.

18. (Previously presented) A process according to claim 1, wherein the organic groups R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹, R¹⁰, R¹¹ and R¹² when associated with their respective carbon atom form composite groups which are at least as sterically hindering as t-butyl.

19. (Original) A process according to claim 1, wherein the bidentate ligands are selected from bis (di-t-butyl phosphino)-o-xylene (also known as 1,2 bis (di-t-butylphosphinomethyl)

benzene); 1,2 bis (diadamantylphosphinomethyl) benzene; 1,2 bis (diadamantylphosphinomethyl) naphthalene; 1,2 bis (di-t-pentyl phosphino)-o-xylene (also known as 1,2 bis (di-t-pentyl-phosphinomethyl) benzene); and bis 1,2 (di-t-butyl phosphino) naphthalene.

20. (Previously presented) A process according to claim 1 wherein suitable Group VIIIIB metals or a compound thereof which may be combined with a compound of formula I include cobalt, nickel, palladium, rhodium and platinum.

21. (Currently amended) A process according to claim 19, wherein suitable compounds of such Group VIII metals include: salts of such metals with, or compounds comprising weakly coordinated anions derived from, nitric acid; sulphuric acid; lower alkanolic (up to C₁₂) acids such as acetic acid and propionic acid; sulphonic acids such as methane sulphonic acid, chlorosulphonic acid, fluorosulphonic acid, trifluoromethane sulphonic acid, benzene sulphonic acid, naphthalene sulphonic acid, toluene sulphonic acid, e.g. p toluene sulphonic acid, t butyl sulphonic acid, and 2-hydroxypropane sulphonic acid; sulphonated ion exchange resins; perhalic acid such as perchloric acid; halogenated carboxylic acids such as trichloroacetic acid and trifluoroacetic acid; orthophosphoric acid; phosphonic acids such as benzenephosphonic acid; and acids derived from interactions between Lewis acids and Brønsted acids; the optionally halogenated tetraphenyl borate derivatives; zerovalent palladium complexes particularly those with labile ligands; or tri(dibenzylideneacetone)dipalladium.

22. (Currently amended) A process according to claim ~~20~~ 21, wherein the anion may be derived from or introduced as one or more of an acid having a pKa measured in aqueous solution at 18°C of less than 4.

23. (Previously presented) A process according to claim 1, wherein the carbonylation is carried out at a temperature of between -10 to 45°C.

24. (Previously presented) A process according to claim 1, wherein the carbonylation is carried out at a CO partial pressure of less than $15 \times 10^5 \text{ N.m}^{-2}$.

25. (Previously presented) A process according to claim 1, wherein the reaction is carried out on ethylenically unsaturated C₃-C₂₀ compounds.

26. (Previously presented) A process according to claim 1, wherein the ethylenically unsaturated compound is an alkene having 1, 2, 3 or more carbon-carbon double bonds per molecule.

27. (Previously presented) A process according to claim 1, wherein the ethylenically unsaturated compound may, when there are sufficient number of carbon atoms, be linear or branched, be substituted, be cyclic, acyclic or part cyclic/acyclic, and/or be optionally substituted or terminated by one or more substituents selected from lower alkyl, aryl, alkylaryl, Het, alkylHet, halo, OR¹⁹, OC(O)R²⁰, C(O)R²¹, C(O)OR²², NR²³R²⁴, C(O)NR²⁵R²⁶, NO₂, CN, SR²⁷ wherein R¹⁹ to R²⁷ each independently represent hydrogen or lower alkyl.

28. (Previously presented) A process according to claim 1, wherein the ethylenically unsaturated compounds may be independently selected from ethene, propene, 1-butene, 2-butene, isobutene, 1-pentene, 2-pentene, 3-pentene and branched isomers thereof, 1-hexene and its isomers, 1-heptene and its isomers, 1-octene and its isomers, 1-nonene and its isomers, 1-decene and its isomers, the C₁₁-C₂₀ alkenes and their known isomers, 3-pentenitrile, methyl-3-penteneoate, 1,3 butadiene, 1,3-pentadiene, 1,3 hexadiene, 1,3 cyclohexadiene, 2,4-leptadiene, 2-methyl 1,3 butadiene.

29. (Canceled)

30. (Canceled)

31. (Canceled)

32. (New) A process according to claim 1, wherein R¹ to R¹⁸ each independently is selected from the group consisting of methyl, ethyl, n-propyl, iso-propyl, n-butyl, iso-butyl, tert-butyl, pentyl, hexyl and cyclohexyl.

33. (New) A process according to claim 1, wherein each of said cyclic structures is selected from the group consisting of adamantyl, 1-norbornyl or 1-norbornadienyl.

34. (New) A process according to claim 19, wherein each of said weakly coordinated anions is derived from an acid selected from the group consisting of acetic acid, propionic acid; methane sulphonic acid, chlorosulphonic acid, fluorosulphonic acid, trifluoromethane sulphonic acid, benzene sulphonic acid, naphthalene sulphonic acid, toluene sulphonic acid, p-toluene sulphonic acid, t-butyl sulphonic acid, and 2-hydroxypropane sulphonic acid; sulphonated ion exchange resins; perchloric acid; trichloroacetic acid; trifluoroacetic acid; orthophosphoric acid; and benzenephosphonic acid.

35. (New) A process according to claim 12, wherein, the organic molecule having a hydroxyl functional group is a C₁-C₈ alkanols selected from the group consisting of methanol, ethanol, propanol, iso-propanol, iso-butanol, t-butyl alcohol, n-butanol, phenol and chlorocapryl alcohol.

36. (New) A process according to Claim 21, wherein the palladium complex is tri(dibenzylideneacetone)di-palladium.